Magnetic Resonance Imaging 2003 vol.21 N9, pages 1009-1017

Water self-diffusion in Chlorella sp. studied by pulse field gradient NMR

Cho C., Hong Y., Kang K., Volkov V., Skirda V., Lee C.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The water self-diffusion behavior in chlorella water suspension was investigated by pulsed field gradient NMR technique. Three types of water was determined, which differs according to the self-diffusion coefficients; bulk water, extracellular and intracellular water. Intracellular and extracellular water self-diffusion were restricted, and the sizes of restriction regions were 3.4 μm and 17 μm, respectively. The water molecular exchange process between these three diffusion regions was investigated. The residence time and exchange rate constant for chlorella cells were obtained. The cell wall permeability determined from the rate constant as 3 × 10-6 m/s agreed with the permeability 10-6 m/s obtained from time dependence of intracellular water self-diffusion coefficient. The structural cluster model of chlorella cell is estimated to describe the extracellular water self-diffusion in chlorella water suspension.

http://dx.doi.org/10.1016/S0730-725X(03)00206-6

Keywords

Chlorella sp., PFG-NMR, Water diffusion